



Appendix A

Table of References Found for Dynamic Lycra Orthoses Literature Review In Hierarchy of Evidence (BMJ 2001)

	Hierarchy of Evidence	Title	Area of Body	Study Type	N=	Notes	Year
Elliott et al (1)	1	Lycra arm splints improve movement fluency in children with cerebral palsy	Upper limb orthoses	RCT Parallel groups with waiting list control	16	3D upper limb kinematics S	2010
Blair et al (2)	2++	A study of a dynamic proximal stability splint in the management of children with cerebral palsy	Suit	Descriptive study, Cross over trial and recipient trial	24	8 matched pairs criticism for ?impartiality due to video scoring with / without the garments	1995
Edwards,K (3)	2++	Using Motion Analysis to Investigate whether Wearing Dynamic Lycra Garments Changes Posture and Movement in Children with Cerebral Palsy	Suits	Group study	5	Gait analysis Changes in posture and gait, improved proximal stability increase in cadence	2004
Gracies,J (4)	2++	Lycra Garments Designed for Patients with Upper Limb Spasticity: mechanical effects in Normal Subjects	Glove	Double blind	10	Health subjects used to investigate the stretch to pronator muscles by garment. T-Test	1997

						Donning technique important. Long lasting Angular displacement	
Gracies.J (5)	2++	Short – term Effects of Dynamic lycra Splints on Upper Limb in Hemiplegic Patients	Gloves	Cross over design 18 – 85 years of age. Hemi, CVA. Sound incl / excl criteria	16	Questionnaire on comfort, circumference of arm, resting posture, spasticity at shoulder, ROM using goniometer, Elbow proprioception Good research section on CNS involvement	2000
Matthews et al	2++	Effects of Dynamic Elastomeric Fabric Orthoses on Children with Cerebral Palsy	Leggings	Multiple Centre single case report methodology ABA design 3-13 years of age (Median age 5.5) 4 male/female	8	10 metre walking test Physiological Cost Index (PCI) Visual analogue Scale (VAS) Patient specific functional scale (PSFS) Subject/Carer perceptions recorded via daily diaries	2009
Morrin.J (6) *	2++	Control of hand oedema by use of lycra pressure garments	glove	Retrospective report - review	95	Oedema control	1981
Brownlee (7)	2+	Edinburgh Dynamic Lycra splinting trial – assessment of hand function	10 suit 10 gloves	Pre-experimental design with a ore / post test. 8 week duration	20	Measured hand function – cognition restricted use ? Dual qual/quant, questionnaires. Difficulties in identifying measurement tool	Oral presentation 2000 Published2002
Castro et al (8) *	2+	A low cost instrumented glove for monitoring forces during object manipulation	Glove	Group experimental design	30	Carrier for force sensing resistors. Pressure measurement	1997

						Of interest to glove research	
Flanagan et al (9)	2+	Evaluation of short – term intensive orthotic garment use in children who have cerebral palsy	Trunkal control using Theratogs	Single, pre-intervention baseline comparison design	5	Biomechanical Assessment Gait analysis Gross Motor assessment	2009
Matthews,M (10)	2+	A pilot study of multiple single case reports to investigate the effects of dynamic Lycra Orthoses on gait in children with diplegic cerebral palsy	Full length Leggings	Group of replicated measures single case studies.	8	Exoskeleton to weakened muscles Reduced energy expenditure Positive gait changes	2007
Nicholson,J (11)	2+	Assessment of Upper Limb function and movement in children with cerebral palsy wearing Lycra garments	Suit	Journal publication	12 (5)	Questionnaire, PEDI, Motion analysis Functional skills, No botox, Wilcoxen test	2001
Rennie.D (12)	2+	An evaluation of Lycra garments in the lower limb using 3-Dgait analysis and functional assessment (PEDI)	Whole body suits	Group study Gait lab	8	PEDI ? not appropriate tool Issues of toileting Gait analysis No reports of breathing difficulties Reduced carer assistance	2000
Rand.D (13) *	3	An instrumented glove for monitoring MCP joint motion	Glove	Experimental	4	Goniometric measurement Of interest to glove research	1993
Attard et al (14)	3	Review of the use of Lycra pressure orthoses for children with cerebral palsy – including examples of two case studies	Glove Suit	Single case study	2	Review of current literature 2003 Discussion of possible causes of effect	2004
Barbarioli (15)	3	A Lycra glove working	Glove	Case study	1	Descriptive study of	2001

		splint for rheumatoid arthritis: a case study				rheumatoid function	
Bridges,S (16)	3	An evaluation of the immediate effects of elasticated compression on joint proprioception	Socks	Repeated measure design Pilot study as part of MSc degree	6	GMFM, PCI & 10m walking test, socks improved function and gait performance	2004
Brownlee.et al (17)	3	Edinburgh Dynamic Lycra Splinting Trial-assessment of hand function	Glove / suit	Pre-experimental design Questionnaire	20	Article of main 3work	2002
Corn, K (18)	3	Impact of Second Skin Lycra Splinting on the Quality of Upper Limb Movement in Children	Upper Limb	Group of Single Case Studies	4	PEDI, Comparison of two patient groups of long /short term users	2003
Edmondson.J (19)	3	How effective are Lycra suits in the management of children with CP	Total Body	Group of single case	15	Untried measurement score. Good references	1999
Gibbs.S (20)	3	Dynamic Lycra Splinting in a child with Cerebral Palsy: an objective assessment of gait.	Suit	Single case presentation	1	Smoothing of pelvic movement, reduced adduction, significant increase in temporal distance parameters	2002
Hylton.N (21)	3	The use of compression stabilizing type bracing as an adjunct to therapy	Shorts	Single case	4	Discussion paper prior to full paper	1996
Hylton.N (22)	3	The development and use of SPIO Lycra compression bracing in children with neuro-motor deficits	Suit	Single case	1	Observational Discussion	1997
Kennedy.S (23)	3	The treatment of inter-phalangeal joint flexion contractures with reinforced Lycra finger sleeves	finger	Single case study	2	Cosmetic acceptability	1998
Knox.V (24)	3	The use of Lycra garments in children with cerebral palsy: a report of a descriptive clinical trial	Suit	Repeated measures Single case group	8	GMFM Quest Good literature review. Non biased report	2003

						Discussion of Melbourne Test	
Matthews,M (25)	3	The Use of Dynamic Lycra Orthoses in the Treatment of Scoliosis	Suit	Single Case Study	1	X-ray evidence New treatment protocol	2005
Oglieve,K (26)	3	An audit of satisfaction amongst people who are wearing dynamic Lycra Orthoses for the Management of Upper Limb Movement disorders caused by Neurological disorders.	Gloves	Questionnaires of users	15	Subjective improvement in posture, gait, arm awareness, confidence, arm use. Using VAS	2006
Paleg.G (27)	3	Dynamic Trunk Splints and Hypotonia	Trunk	Single Case Benek Suit	1	GMFT/questionnaire Limited references/ No discussion	2001
Pitt.F (28)	3	The use of Lycra socks in peripheral sensory deficit – a case study	Sock	Case study	1	Proprioceptive feedback	2002
Watson.M 2007 (29)	3	An evaluation of the effects of a dynamic Lycra orthosis on arm function in a late stage patient with acquired brain injury	Long armed glove	Case Study	1	Rehabilitation	2007
Coghill, J & Simkiss, D (30)	1-	Question 1 Do Lycra garments improve function and movement in children with cerebral palsy	ALL AREAS	Literature review	8	Although 66 papers found only 8 relevant to research question	2010
Fisher et al (31)	4	Effects of a “SNUG” Sensory Dynamic Orthosis on Gross Motor Function in Children with Cerebral Palsy	Trunk	Multi-centre Study 1-23 years of age (Median 7 years) 21 males/10 females GMFCS GMFM 88	31	Conference Abstract Statistically Significant change in GMFM 88	2010
Matthews, M (32)	4	A pilot study of the effects of Dynamic Elastomeric	Lower Limb	Single case report Video analysis	1	Conference Abstract Comparison Video	2010

		Fabric Foot Orthoses on Gait in Subjects with Chronic Hemiplegia				Analysis	
Matthews et al (33)	4	Dynamic Lycra Orthoses for Shoulder Instability	Upper trunk and arm	Single case report X- ray pre and post intervention	1	Conference abstract Visual X- ray change	2010
National Horizon (34)	4	Lycra garments for cerebral palsy and movement disorders	Upper limb and Trunk	Review of known knowledge		Government Review	2002
Preisler, B & Eve, K (35)	4	The treatment of Young Children with Low Trunkal Tone as a Result of a Result of Various Diagnoses, with Dynamic GPS Soft Orthoses- Case studies	Trunk	Review 18 months – 3 years of age	3	Conference Abstract Improved trunk stability Functional changes	2010
Sawle, L (36)	4	Developing a dynamic Elastomeric Fabric Orthosis to Manage Pregnancy- Induced Pelvic Pain	Low Trunk	Single Case Review	1	Conference Abstract Subjective improved pain management and function	2010
Wynne, J et al (37)	4	Acceptance and Outcomes of the Dynamic Elastomeric Fabric Wrist Hand Orthosis in the Paediatric Population.	Upper Limb	Quality Audit and review of trends in wearer profile, treatment plan, follow up schedules and outcomes	Not stated	Conference Abstract General Review	2010

© MM/UEA 22/12/2010

Reference List

- (1) Elliot C, Reid S, Hamer P, Alderson J, Elliott B. Lycra arm splints improve movement fluency in children with cerebral palsy. Gait Posture. In press 2010.
- (2) Blair E, Ballantyne J, Horsman S, Chauvel P. A study of a dynamic proximal stability splint in the management of children with cerebral palsy. Dev Med Child Neurol 1995 Jun;37(6):544-54.
- (3) Edwards K, Cramp M. Using motion analysis to investigate whether wearing dynamic Lycra garments changes posture and movement in children with cerebral palsy – A pilot study University of east London; 2004.
- (4) Gracies J. Lycra garments designed for patients with upper limb spasticity: mechanical effects in normal subjects. Arch Phys Med Rehabil 1997 Oct;78:1066-71.
- (5) Gracies J, Marosszeky J, Renton R, Sandanam J, Gandevia S, Burke D. Short-term effects of dynamic lycra splints on upper limb in hemiplegic patients. Arch Phys Med Rehabil 2000 Dec;81(12):1547-55.
- (6) Morrin J, Taylor K, Bruce Connolly W. Control of Hand Oedema by use of Lycra Pressure Garments. Australian Occupational Therapy Journal 1981;28(4):167-74.
- (7) Brownlee F. Evaluation of lycra based dynamic splinting in treatment of children with cerebral palsy. Dev Med Child Neurol 2000;2-7.
- (8) Castro M, Cliquet AJ. A low-cost instrumented glove for monitoring forces during object manipulation. IEEE Trans Rehabil Eng 1997 Jun;5(2):140-7.
- (9) Flanagan A, Krzak J, Peer M, Johnson P, Urban M. Evaluation of Short -Term Intensive Orthotic Garment Use in Children Who Have Cerebral Palsy. Pediatric Physical Therapy 2009;21(2):201-4.
- (10) Matthews M. A pilot study of multiple single case reports to investigate the effects of dynamic Lycra orthoses on gait in children with diplegic cerebral palsy University of East Anglia; 2007.
- (11) Nicholson J, Morton R, Attfield S, Rennie D. Assessment of upper-limb function and movement in children with cerebral palsy wearing lycra garments. Dev Med Child Neurol 2001 Jun;43(6):384-91.

- (12) Rennie D, Attfield S, Morton R, Polak F, Nicholson J. An evaluation of lycra garments in the lower limb using 3-D gait analysis and functional assessment (PEDI). *Gait Posture* 2000 Sep;12(1):1-6.
- (13) Rand D, Nicol A. An instrumented glove for monitoring MCP joint motion. *Proc Instrn Mech Engrs* 1993;207:207-10.
- (14) Attard J, Rithalia S. Review of the Use of Lycra Pressure Orthoses for children with Cerebral Palsy - including two case studies. *International Journal of Therapy and Rehabilitation* 2004;11(3):120-6.
- (15) Barbarioli M. A Lycra Working Splint for Rheumatoid Arthritis: a case study. *British Journal of Occupational Therapy* 2001 Jul;64(7).
- (16) Bridges S, Mayston M, Peirson J. The effects of dynamic socks in ambulant children with cerebral palsy: a pilot study University College London; 2004.
- (17) Brownlee F, McLeman A. Edinburgh Dynamic Lycra Splinting Trial - assessment of hand function. *NAPOT Journal* , 19-21. 2002. National Association of Paediatric Occupational Therapists.
Ref Type: Magazine Article
- (18) Corn K, Imms C, Timewell G, Carter C, Collins L, Dubbeld S, et al. Impact of Second Skin Lycra Splinting on the Quality of Upper Limb Movement in Children. *British Journal of Occupational Therapy* 2003 Oct;66(10):464-72.
- (19) Edmondson J. How effective are lycra suits in the management of children with cerebral palsy? *A P C P Journal* 1999;March 1999:49-57.
- (20) Gibbs S, Lomax D, Abu-Arafeh, Linskill J. Dynamic Lycra Splinting in a child with cerebral palsy: an objective assessment of gait. 2002.
Ref Type: Personal Communication
- (21) Hylton N. The Use of Compression Stabilizing Type Bracing as an Adjunct to Therapy. Children's Therapy Center; 1996.
- (22) Hylton N. The development and use of SPIO lycra compression bracing in children with neuromotor deficits. *Pediatric Rehabilitation* 1997;1(2):109-16.
- (23) Kennedy S, Peck F, Stone J. The treatment of interphalangeal joint flexion contractures with reinforced lycra finger sleeves. *J Hand Ther* 2000 Jan;13(1):52-5.

- (24) Knox V. The Use of Lycra Garments in Children with Cerebral Palsy: A Report of a descriptive Clinical Trial. *British Journal of Occupational Therapy* 2003 Feb;66(2):71-7.
- (25) Matthews M, Crawford R. The use of dynamic Lycra orthosis in the treatment of scoliosis. A treatment case study. *Prosthetics & Orthotics International* 2006;30(2):174-81.
- (26) Oglieve K, Poland F, Watson M. An Audit of Satisfaction amongst People who are wearing Dynamic Lycra Orthosis for the Management of Upper Limb Movement Disorders caused by neurological disorders. Norwich: University of East Anglia; 2006.
- (27) Paleg G. Dynamic Trunk Splints and Hypotonia. *American Academy for Cerebral Palsy and Developmental Medicine* 1999 Jun;1-5.
- (28) Pitt F. The use of lycra socks in peripheral sensory deficit - a case study. 2002. Report No.: June 2002.
- (29) Watson M, Crosby P, M. Matthews. An evaluation of the effects of a dynamic Lycra orthosis on arm function in a late stage patient with acquired brain injury. *Brain Injury* 2007;21(7):753-61.
- (30) Coghill J, Simkiss D. Question 1 Do Lycra garments improve function and movement in children with cerebral palsy. Ref Type: Generic
- (31) Fisher K, Dabrowski E, Backer G, Thomas R, Kraus J, Mancin C, et al. Effect of a "SNUG" Sensory Dynamic Orthosis on Gross Motor Function in Children with Cerebral Palsy. 2010 May 14; 2010.
- (32) Matthews M. A Pilot study of the Effects of Dynamic Elastomeric Fabric Foot Orthoses on Gait in Subjects with Chronic Hemiplegia. 2010 May 14; 2010.
- (33) Matthews M, Payne C, Watson M. Dynamic Lycra Orthoses Treatment for Shoulder Instability. 2010 May 14; 2010.
- (34) National Horizon Scanning Centre. New and Emerging Technology Briefing- Lycra garments for cerebral palsy and movement disorders. 2002 Jul.
- (35) Priesler B, Eves K. The treatment of Young children with low trunkal tone as a result of various diagnoses, with dynamic GPS soft orthosis- case studies. 2010 May 14; 2010.

- (36) Sawle L. Case Study: Developing a Dynamic Elastomeric Fabric Orthosis to manage Pregnancy- Induced Pelvic Pain. 2010 May 14; 2010.
- (37) Wynne J, Corriea A, Matthews M, Marquardt K, Dingman R. Acceptance and Outcomes of the Dynamic Elastomeric Fabric Wrist Hand Orthosis in the Pediatric Population. 2010 May 10; 2010.

*** Papers not directly linked to the Dynamic Lycra Orthoses study as used as carriers for other instruments and to control oedema.**